Suite 322
315 South Allen Street
State College, Pennsylvania 16801

February 3, 1998

Mr. Ronald W. Carmichael
Division Administrator
Federal Highway Administration
228 Walnut Street, Room 558
Harrisburg, PA 17101-1720

Dear Mr. Carmichael:

The U.S. Fish and Wildlife Service has reviewed the project plans and Biological Assessment for the proposed replacement of the Kennerdell Bridge (S.R. 3008, Section B00), located over the Allegheny River in Clinton and Rockland Townships, Venango County, Pennsylvania. Your September 23, 1997, request for formal consultation was received on September 26, 1997. This document represents the Service's biological opinion on the effects that the proposed activity will have on two federally listed endangered freshwater mussel species: the clubshell mussel (*Pleurobema clava*) and northern riffleshell mussel (*Epioblasma torulosa rangiana*). This biological opinion is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended, (16 U.S.C. 1531 *et seq*.).

This biological opinion is based on information provided in the Biological Assessment (dated August 7, 1997), field investigations, meetings (see consultation history), and other information available in our files. A complete administrative record of this consultation is on file in this office.

CONSULTATION HISTORY

The history of this consultation is as follows:

2/14/94 The Pennsylvania Department of Transportation (PennDOT) requests from the Service information on listed species which may occur in the area of the proposed bridge replacement project.

3/11/94 The Service notifies PennDOT that two endangered freshwater mussels, the clubshell and northern riffleshell, may occur in the project area. The Service advises that surveys for these species should be conducted, and requests additional project information so that it can assist in the design of a mussel survey.

10/02/95 - 10/12/95 PennDOT and consultants, Aquatic Systems Corporation, conduct a mussel survey in project area.

10/06/95 Memorandum from the Service to PennDOT and consultants modifying mussel survey protocol by reducing the scope of the survey, based on preliminary survey results.

10/13/95 Consultants provide to the Service, via facsimile, preliminary results of the mussel survey, indicating that both the clubshell and northern riffleshell were found.

07/01/96 PennDOT requests updated information on listed and proposed species which may occur in project area.

07/19/96 Service letter of response to PennDOT request: 1) states that no other federally listed species, besides clubshell and northern riffleshell are known or likely to occur within project area; 2) reminds PennDOT that the Service has not received the mussel survey report; 3) recommends that PennDOT meet with the Service to discuss construction alternatives that would avoid or minimize adverse effects to mussels; and 4) recommends that a biological assessment be prepared by PennDOT prior to any request for initiation of formal consultation.

09/30/96 PennDOT submits draft mussel survey report to the Service for review.

11/18/96 PennDOT, Federal Highway Administration (FHwA), and Service meet to discuss construction alternatives that would minimize adverse effects to listed mussel species. PennDOT provides to Service *Construction Options Evaluation Report* (11/96 draft). PennDOT requests written recommendations for preparation and content of a biological assessment.

11/27/96 Service provides PennDOT with written guidance on information required to initiate formal consultation and recommended contents of a biological assessment.

12/09/96 PennDOT and the Service meet to continue discussion of construction alternatives. The demolition alternative receives Service concurrence. *Construction Options Evaluation Report* (12/09/96 draft) discussed. PennDOT agrees to further assess several construction options that may minimize impacts to mussels.

12/16/96 Service provides PennDOT's consultant with written guidance on information required to initiate formal consultation and recommended contents of a biological assessment.

12/31/96 PennDOT submits *Final Construction Options Evaluation Report* (dated 12/20/96) for Service review and concurrence. PennDOT selects construction Option E (use of

causeways and temporary bridges).

01/30/97 The Service requests that PennDOT further evaluate one of the construction alternatives identified as having the least impacts to listed mussels and their habitat.

03/14/97 PennDOT submits to the Service the final mussel survey report (dated 02/97).

05/23/97 PennDOT submits to the Service, for review, the Draft Biological Assessment for the proposed project.

06/24/97 PennDOT, consultants, FHwA, Pennsylvania Fish and Boat Commission (PFBC), and Service meet to discuss comments on the Draft Biological Assessment.

08/05/97 PennDOT, FHwA, PFBC, consultants, and Service meet to discuss potential reasonable and prudent measures, including, mussel translocation and precautions against zebra mussel contamination. Service provides PennDOT with written guidance on the scope of the mussel translocation.

09/23/97 FHwA requests in writing the initiation of formal consultation, transmitting PennDOT's revised Biological Assessment (dated 08/07/97). Service receives this request on 09/26/97.

11/18/97 Service acknowledges receipt of FHwA's request to initiate formal consultation, indicating that all required information has been supplied. Service expects to provide FHwA with a biological opinion before 02/08/98.

02/03/98 Service transmits its biological opinion to FHwA.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The following project and project area descriptions are taken from PennDOT's August 7, 1997, *Biological Assessment on the Replacement of the Kennerdell Bridge over the Allegheny River (S.R. 3008, Section B00) in Clinton and Rockland Townships, Venango County, Pennsylvania*.

Project Area

The drainage basin of the upper Allegheny River comprises 4,475 square miles. The project area, located at river mile (RM) 107.5, is within an area designated by the U.S. Forest Service as a Wild and Scenic River Corridor; however, this section of the Corridor is designated as recreational. The river

within the project area has a designated use of "warm water fishery," as assigned by the Pennsylvania Department of Environmental Protection. At the bridge site, the Allegheny River is 635 feet wide.

Much of the land surrounding the river within the project area is managed as State Forest lands or is used for single family seasonal residences. The land adjacent to the Allegheny River is sparsely populated from immediately south of Franklin, Pennsylvania (RM 123.0) to the Kennerdell Bridge (RM 107.5). Industrial development appears to be absent from the shoreline.

The Allegheny River tract of Clear Creek State Forest, which is managed as non-commercial forest land, occurs on the southwest shore of the project area. The Village of Kennerdell occurs on the northeast side of river. The small town consists primarily of permanent residences, small businesses, and summer cottages. A public boat ramp is located on the northeast side of the river, approximately 1,500 feet upstream from the bridge. This segment of the Allegheny River is used primarily for recreational purposes, such as swimming, fishing, canoeing, and power boating, and is considered an outstanding fishery for both game and nongame species by the Service and the Pennsylvania Fish and Boat Commission.

Four major flood control projects have been constructed in the Allegheny River watershed upstream of the proposed project: Tionesta Dam, Kinzua Dam, Union City Dam and Woodcock Creek Dam. The four projects combined regulate the flow from 2,926 square miles, more than 50 percent of the upper Allegheny River drainage basin. These flood control projects are expected to reduce major flood crests on the Allegheny River by approximately 2.5 to 6.0 feet. Ninety miles upstream, the Kinzua Dam (RM 197.3), located in Warren County, affects river flow within the project area. Within the project area, river level estimates are as follows: low flow is 914 feet above mean sea level (amsl), ordinary high water is 922 amsl, and the 100-year flow level is 933 feet.

Project Description

PennDOT proposes to replace the existing bridge's superstructure on the existing piers on the same alignment. The existing bridge is a 905-foot long, 20-foot wide Parker truss-variation style bridge, which was built in 1907 and rehabilitated in 1981. The existing bridge has six spans, two abutments, and five piers. The proposed replacement bridge will be a three-span (span lengths = 280 feet, 280 feet, and 260 feet), multi-girder bridge, with the girders constructed using steel plates. The dimensions of the new bridge will be 36 feet wide by 820 feet long.

Construction is expected to begin in the spring of 1999 and take approximately 26 weeks to complete (Biological Assessment (BA), Appendix C, p. 13). During construction, a detour will be in place to route traffic from one side of the river to the other.

The new bridge will be constructed on two existing stone masonry piers (Piers 2 and 3) which are located in the river channel. The existing two abutments and three upland piers (Piers 1, 4, and 5) will

be removed, and two new abutments will be constructed in slightly different upland locations (BA, Appendix C, Exhibit 2). There will be minor shifts in the alignment to improve the roadway approaches.

To remove the existing bridge, the bituminous deck will be scraped and the deck support panels cut and lifted away. The three spans over the river channel will then be dropped (via explosives) into the river (or partially onto the causeway), and dismantled by dragging and cutting the steel for hauling.

A causeway will be constructed to allow for access during demolition of the existing structure and construction of the replacement bridge (BA, Appendix C, Exhibit 8). Two stationary cranes will be used to lift and place the steel girders of the new bridge. These cranes will be placed on the perpendicular "fingers" of the causeway. The causeway will also provide a base for removing sections of the old bridge, and temporarily supporting structures (e.g., the heavy steel girders) during new bridge construction. The causeway will be in place for approximately 22 weeks of the 26-week construction period.

The causeway will consist of three work platforms constructed of clean rock-fill material, connected by three temporary bridges (Figure 1). Water will be able to flow under these temporary bridges, which are being used to minimize the amount of fill in the river channel. The layout, locations and estimated size of the causeway components are as follows: 1) a rock platform extending from the southwest bank approximately 50 feet into the river, 2) a temporary bridge (70 feet long), 3) a 135 x 200-foot rock platform surrounding Pier 3, 4) a temporary bridge (65 feet long) located midway between Piers 3 and 2, 5) a 100 x 200-foot rock platform surrounding Pier 2, and 6) a temporary bridge (60 feet long) connecting the latter platform with the northeast bank of the river. The work platforms surrounding Piers 2 and 3 will each contain a sediment trap.

The proposed surface elevation of the causeway is 924 feet. The 20-foot top width of the causeway would cause the bottom width to vary from 45 to 135 feet, depending upon river depth, and assuming 1½:1 side slopes. The total area of disturbance associated with the causeway consists of approximately 7,933 m^2 (1.96 acres) of temporary fill placed on the river bed (BA, p. 11). Because the exact footprint of the causeway has not been determined (it will depend upon the final design of the bridge), buffers 10 feet upstream, 20 feet lateral, and 30 feet downstream of the proposed work platforms have been included in the total estimated causeway footprint. The area to be disturbed during bridge demolition overlaps to a large extent the footprint of the causeway, and has therefore been included in the 7,933 m^2 of impact described above.

Nine culverts (72-inch and 96-inch diameter) will be installed in the causeway to reduce pooling impacts: five culverts in the work platform surrounding the west pier (Pier 3), and four culverts in the work platform surrounding the east pier (Pier 2) (BA, Appendix D).

A temporary access road from S. R. 3008 to the causeway will be constructed on the northeast

bank (BA, Appendix C, Exhibit 8). The Service assumes that one or more construction staging areas (e.g., areas to store and retrieve equipment, materials, vehicles, and fuel) will also be required; however, none are mentioned in the Biological Assessment.

Conservation Measures

In association with this project, PennDOT proposes to implement several conservation measures (referred to as "commitments" in the BA, pp. 15-17). A summary of the most significant of these conservation measures follows.

1) Commitments related to endangered mussels:

   a) Translocate all mussels, including the clubshell and northern riffleshell, from the project impact area to suitable habitat upstream. In accordance with protocols subject to approval by the Service, mussels will be collected and relocated to suitable habitat in late summer prior to beginning project construction.

   b) Monitor translocated mussels at least three times during the five-year post-construction period.

   c) Monitor mussels upstream and downstream of the direct impact area to detect the adverse effects of the causeway, including pooling, scouring, and sediment deposition.

   d) Ensure that all equipment associated with construction and the mussel translocation is free of zebra mussels.

   e) Implement pollution prevention and control measures to reduce the potential for toxic spills into the Allegheny River.

2) Construction-related commitments:

   a) Limit construction to one construction season.

   b) Install flow-through culverts in the causeway.

   c) Maximize the length of the temporary bridges associated with the causeway.

   d) Ensure that the causeway is completely removed.

   e) Develop and implement an erosion and sedimentation (E&S) control plan. The E&S plan is subject to review and approval by the Service. Daily site monitoring will be

conducted to ensure plan implementation.

f) Visually monitor the project area daily to identify any construction-related impacts from scouring or sedimentation.

g) Instruct contractors on the importance of the natural resources in the project area and the need to ensure proper implementation of the required sedimentation control practices.

STATUS OF THE SPECIES

General Biology of Freshwater Mussels in the Family Unionidae

Freshwater mussels are sedentary filter-feeders, filtering oxygen and food from the water column across their gills. The breeding season is initiated by changes in water temperature. Females hold unfertilized eggs in water tubes within specialized regions of the gills called marsupia. Males liberate sperm into the water and females lying downstream uptake the sperm with incoming water. The eggs are then fertilized in the water tubes within the marsupium. The fertilized eggs develop into minute bivalve larvae, or glochidia, which, in turn, develop over a period of days to months. While in the marsupium, developing glochidia are exposed to the adult's circulatory fluid, but not directly to the water column (Gardiner *et al*. 1991, Richard *et al*. 1991).

The glochidia of most unionids are believed to be obligate parasites, with fish serving as the host organism. Although many unionids are probably host-specific, the degree of host specificity and the host species for most unionid species, including the clubshell and northern riffleshell, are unknown (U.S. Fish and Wildlife Service 1994). However, preliminary data indicate that the following species may serve as hosts (Watters 1996, 1997):

Clubshell	Northern riffleshell
striped shiner	banded darter
blackside darter	bluebreast darter
central stoneroller	brown trout
logperch	banded sculpin

Methods of host infestation depend on how glochidia are released. Some unionid species expel glochidia out the exhalant siphon. Host fishes either take in suspended glochidia and pass them over their gills, where they attach, or they contact them on the substrate, where they attach to fins or skin. Other unionids bind glochidia into long mucus conglutinates which resemble prey items. Gills become infested when fish eat the conglutinates (U.S. Fish and Wildlife Service 1994).

After encysting on the host fish, the glochidia transform into juveniles. They fall from their host and

burrow into the substrate or attach to larger objects.

Clubshell mussel (*Pleurobema clava*)

The clubshell was listed as endangered, without critical habitat, in 1993. This is a small to medium size mussel, up to three inches long. The shell exterior is yellow to brown with bright green blotchy rays. The shell interior is white. The shell is wedge-shaped and solid, with a pointed, and fairly high umbo.

Historically, this species was once abundant throughout Ohio River tributaries in Illinois, Indiana, Kentucky, Michigan, Ohio, Pennsylvania, and West Virginia. It was widespread in Ohio River basin rivers such as the Ohio, Allegheny, Scioto, Kanawha, Little Kanawha, Licking, Kentucky, Wabash, White, Vermillion, Mississinewa, Tippecanoe, Tennessee, Green, and Salt Rivers. The clubshell was also located in the Maumee River basin, and tributaries of western Lake Erie such as the Huron River and the River Raison (Stansbery *et al*. l982). This species has declined drastically with a greater than 95 percent range reduction. The largest remaining population is in the Tippecanoe River, Indiana. The mainstem Allegheny River supports what appears to be a sparse viable population, but with low numbers and a discontinuous distribution over 66+ miles (C. Bier, WPAC, *in litt*. 6 January 1994, *in* U.S. Fish and Wildlife Service 1994).

Clubshell populations are presently known to occur in the following streams:

State	River System	County	Reproducing?
Indiana	Tippecanoe River	Kosciusko, Fulton, Pulaskia, Tippecanoe	yes
Kentucky	Green River	Taylor, Green, Hart	probably
Michigan	East Fork of the West Branch of the St. Josephs River	Hillsdale	unknown
Ohio	Fish Creek	Williams	probably
	Little Darby Creek	Madison	yes
	Pymatuning Creek	Ashtabula	no
	St. Joseph River	Williams	possibly
	West Branch of the St. Joseph River	Williams	possibly
	Walhonding River	Coshocton	possibly
Pennsylvania	Allegheny River	Clarion, Forest, Warren, Venango	yes
	Conneaut Outlet	Crawford	unknown; nearly extirpated
	Conneauttee Creek	Crawford	unknown
	French Creek	Crawford, Erie, Mercer, Venango	yes
	LeBoeuf Creek	Erie	yes
	Muddy Creek	Crawford	probably
West Virginia	Elk River	Kanawha	yes
	Hackers Creek of the West Fork River	Lewis	unknown
	Meathouse Fork	Doddridge	unknown

The clubshell inhabits clean, packed or loose, coarse sand and gravel in runs, often just downstream of a riffle, in medium to small rivers and streams (Stansbery *at al*. 1982). It cannot tolerate mud or slack water conditions (U.S. Fish and Wildlife Service 1994). The clubshell typically burrows completely beneath the substrate two to four inches, apparently relying on water to percolate between the sediment particles (Watters 1990).

The clubshell has a life span of 20 years or more. It is a short term breeder (tachytictic); i.e., fertilization takes place in mid-spring and the embryos (glochidia) are discharged into the water column in mid-summer (Ortman 1919). Many aspects of the life history of this rare mussel are not known.

Northern Riffleshell (*Epioblasma torulosa rangiana*)

The northern riffleshell was listed as endangered, without critical habitat, in 1993. It is a small to medium size mussel, up to three inches long. The shell exterior is brownish-yellow to yellowish-green with fine green rays. The shell interior is white, rarely pink. The species is sexually dimorphic; male shells are irregular ovate in outline, with a wide shallow sulcus just anterior to the posterior ridge. Female shells are obovate in outline, and greatly expanded postventrally.

The historical range of this species was somewhat similar to that of the clubshell, but with extensions further north into Michigan and Ontario tributaries of Lake Erie, Lake St. Clair, and the Detroit and St. Clair Rivers (U.S. Fish and Wildlife Service 1994). Like the clubshell, the northern riffleshell has suffered a range reduction of over 95 percent.

The present range of the northern riffleshell has been reduced to:

State	River System	County	Reproducing?
Indiana/Ohio	Fish Creek	Dekalb, Williams	no, possibly extirpated
Kentucky	Green River	Edmonson, Hart	unknown
Michigan	Detroit River drainages	Sanilac	unknown
Ohio	Big Darby Creek	Franklin, Pickaway	no, near extirpation
Pennsylvania	Allegheny River	Clarion, Forest, Venango, Warren	yes
	French Creek	Crawford, Erie, Mercer, Venango	yes
West Virginia	Elk River	Kanawha	yes, but only 2 live young animals have been found

In 1992, a population of the northern riffleshell in the Detroit River in Michigan was found to be threatened by invasion of the exotic zebra mussel (*Dreissena polymorpha*). Divers collected 30 to 40

individuals which were relocated to the St. Clair River in Michigan. About a dozen individuals were kept in captivity. Conditions of the populations in the St. Clair and Detroit Rivers are unknown at this time (T. Weise, Michigan Department of Natural Resources 1995, pers. comm.). Zebra mussels have also been documented from the Maumee River.

The largest remaining populations occur in the Allegheny River and in French Creek, Pennsylvania. In the Allegheny River, the subpopulations range from viable to those with apparently depressed vigor, with an overall known distribution scattered over 80 miles (C. Bier, WPAC, *in litt*. 6 January 1994, *in* U.S. Fish and Wildlife Service 1994).

The northern riffleshell occurs in clean, packed, coarse sand and gravel in riffles and runs of small and large streams (Stansbery *et al*. 1982, Watters 1990). The species buries itself to the posterior margin of the shell, although females may be more exposed, especially during the breeding season (U.S. Fish and Wildlife Service 1994).

The northern riffleshell is a long-term breeder (bradytictic), with fertilization in the late summer and glochidial release the following spring or summer (Ortmann 1919).

Decline of, and Continued Threats to, the Clubshell and Northern Riffleshell

Because mussels are sedentary, they are extremely susceptible to environmental degradation. The range reductions of these mussels are attributed to physical loss of habitat and degraded water quality related primarily to water impoundments, channelization, streambank clearing, and agriculture. Impacts associated with run-off from human waste, chemical outfalls, and coal mining have also affected many tributaries.

The greatest diversity and abundance of mussels are associated with clean-swept sand and gravel substrates. Chronic increases in turbidity and suspended sediments decrease the depth and amount of light penetration, affect primary productivity, decrease oxygen levels, increase water temperature, irritate or cause clogging of gills, and result in a blanket of silt on the substrate. Mussels may be directly affected by siltation through smothering. Siltation also affects mussels by smothering eggs or larvae of the fish host populations and by reducing food availability. Siltation also fills interstitial spaces, eliminating spawning and habitat critical to the survival of young fish.

Pollution from municipal, agricultural, and industrial waste discharges have decreased or eliminated mussel populations directly, and indirectly through elimination of significant species of fish hosts resulting in reproductive failures (U.S. Fish and Wildlife Service 1994).

The exotic, prolific zebra mussel, accidentally introduced to North America in the mid-1980's, poses a severe threat to all native mussel fauna through competition for space, food, and survival of glochidia. Presently, the zebra mussel, which was conveyed to the United States through ship ballast water from

interior European ports, is abundant in the lower Great Lakes and is increasing in other portions of the range of these federally listed species. It is not known to occur in the Allegheny River at this time.

ENVIRONMENTAL BASELINE

Status of the Species (within the action area)

For the purposes of this biological opinion, the action area is defined as the area extending from approximately 2,600 feet upstream to 400 feet downstream of the existing Kennerdell Bridge. This fully encompasses the area where project-related direct and indirect effects to the clubshell and northern riffleshell are likely to occur.

As described above, the clubshell and northern riffleshell occur in low numbers and are discontinuously distributed in the Allegheny River in Clarion, Forest, Venango, and Warren Counties, Pennsylvania. The clubshell is known from over a 66-mile stretch of the Allegheny River (C. Bier, WPAC, *in litt*. 6 January 1994, *in* U.S. Fish and Wildlife Service 1994). The Allegheny River northern riffleshell populations range from viable to those with apparently depressed vigor, with an overall known distribution scattered over 80 miles (C. Bier, WPAC, *in litt*. 6 January 1994, *in* U.S. Fish and Wildlife Service 1994).

Prior to the freshwater mussel surveys conducted in relation to planning for the subject bridge replacement project, neither the clubshell nor the northern riffleshell were known to occur within the project area. However, the northern riffleshell had been documented to occur less than 0.5 miles downstream and approximately 0.75 miles upstream of the Kennerdell bridge site. Clubshells had been documented at sites approximately two miles downstream and 12 miles upstream of the Kennerdell bridge site.

Aquatic Systems Corporation conducted a mussel survey at the Kennerdell Bridge site for PennDOT in October 1995. The survey zone extended from 300 feet upstream to 300 feet downstream of the existing bridge, encompassing those areas most likely to be directly affected by the project. Techniques employed during the survey included the use of clear-bottom buckets in shallow areas (< three feet deep) and diving gear in deep areas (> three feet deep) to conduct searches along line transects (i.e., qualitative surveys); inspection of middens and other shell concentration areas; and excavation of quadrats (i.e., quantitative surveys).

At the time of the survey, river depths within the survey zone were as follows: 1) one to three feet between the northeast bank and Pier 2, 2) three to six feet between Piers 2 and 3, and 3) six to nine feet between Pier 3 and the southwest bank.

Prime mussel habitat, with a boulder/cobble/gravel/sand substrate, is located on the shallow northeast side of the river throughout the survey area. Substrate composition varied little along the transects from

upstream to downstream, but varied more between transects depending on depth and current velocities. Bottom substrate on transects located within 120 feet of the southwest shore, at seven to nine-foot depths, was composed of boulder and large cobble, interspersed with gravel and sand. The substrate at the remaining transects was composed primarily of large to medium cobble, gravel, sand and silt.

During the survey, 948 individuals of 15 species of freshwater mussels were located, including the clubshell and northern riffleshell. Clubshells and northern riffleshells were found in middens, on exposed bridge piers, and during bucket surveys, but were not found in excavated quadrats or during diving searches.

Twelve species of mussels were identified from six middens located on the northeast shore and on the Pier 2 footer ledge. Spent valve pairs from at least 50 northern riffleshells, and nine clubshell spent valves were found in these middens.

Clear-bottom bucket surveys were conducted in depths of less than three feet. Initially, these surveys were done in a broad area; however, a revised protocol allowed for surveys along three-foot wide, 50-foot long transects. A total of 786 live mussels of 15 different species were collected using this method. Six live northern riffleshells were found (four upstream of the bridge and two downstream), and one live clubshell was located (approximately 250 feet downstream of the bridge). These seven specimens were all located in the shallow northeast side of the river. The mucket (*Actinonaias ligamentina*) and the spike (*Elliptio dilatata*) were the most abundant species found.

Initially, the diving surveys in the deeper water (greater than three feet deep) were to be conducted throughout the area extending from 100 feet upstream to 200 feet downstream of the bridge. However, the survey protocol was modified to include only surveys along defined transects. Twelve three-foot wide, 240-foot long transects, aligned parallel to river flow and spaced at 30- to 50-foot intervals, were surveyed. These surveys included areas within 100 feet upstream and downstream of the bridge. Eighty-eight individuals of eight mussel species were located; however, neither the clubshell nor the northern riffleshell was found. Mussels were located on 11 of the 12 transects.

Several 0.25 m^2 (0.5 m x 0.5 m) quadrats were excavated to determine the presence of juvenile mussels, to estimate mussel densities, and to search for the clubshell, which is known to exist several inches below the water/substrate interface. Twenty-seven of these quadrats were sampled in the shallow area between the northeast bank and Pier 2, and eight were sampled in the deeper area between Pier 2 and the southwest bank. All quadrats were located within 100 feet of the bridge. The substrate within each quadrat was excavated to a depth of five inches. Seven species were represented in the quadrat samples, but neither the clubshell nor the northern riffleshell was located in the total 8.75 square meters of substrate sampled.

A maximum of six live mussels were collected in a quadrat, correlating to a maximum density of 24

mussels/m^2. Mean (average) mussel density was 9.8 mussels/m^2 (n = 27 quadrats), much higher than the density anticipated from bucket sampling, which targets mussels readily visible at the water/substrate interface (e.g., larger individuals, larger species, and species not completely burrowed into the substrate). Unlike bucket sampling, whole substrate excavation (quadrat sampling) yields more accurate information regarding mussel density, recruitment, and relative abundance. For example, quadrat sampling demonstrated that the rayed bean (*Villosa fabalis*) (maximum length 1.5 inches) is more abundant (25.8 percent relative abundance) than the bucket sampling suggested (1.5 percent relative abundance). Also, bucket surveys indicated that the mucket was the most abundant species in the survey area, while quadrat and midden sampling indicated that the spike is more abundant. Finally, the fluted-shell (*Lasmigona costata*) was the third most abundant species collected by the bucket survey method, but it was rarely found in the middens.

Juveniles of six mussel species were located by quadrat sampling. Further, juvenile clubshell and northern riffleshell specimens were located in the middens, indicating recruitment for these two species within the project area. Recruitment was not confirmed for five other less common mussel species found.

Neither Asiatic clams (*Corbicula fluminea*) nor zebra mussels were located in the study area.

In August 1997, the Biological Resources Division of the U.S. Geological Survey conducted mussel sampling within the project area at three subsites (D.R. Smith, USGS BRD, Leetown Science Center, personal communication). The following constitutes a partial summary of their preliminary results. Subsite 1 extended from approximately 320 meters below the bridge up to the bridge, in the shallow area between the northeast bank and Pier 2. Two clubshell and 26 northern riffleshell were found within this subsite, at surface densities of 0.02/m^2 and 0.23/m^2, respectively. Subsite 2 was located between and downstream of the piers; three northern riffleshell were found in this area, but no clubshell were located. Subsite 3 was located directly below the bridge, between the southwest bank and Pier 3. Only one species, *Elliptio dilatata*, was found in this subsite.

As evidenced by substrate quality, flow, and mussel density and diversity, the highest quality habitat for mussels, including the two endangered species, appears to extend from the northeast bank to approximately mid-river, in depths (at the time of the survey) ranging from one to four feet. Based on survey results, however, it appears that the clubshell and northern riffleshell, even though showing signs of recruitment, exist at relatively low densities within the project area.

Other than mammalian predation and the present low density of the clubshell and northern riffleshell, there are no identified threats to these species within the action area.

Effects of the Action

It is expected that all clubshell and northern riffleshell not relocated outside of the 7,933 square meter

footprint of the causeway and demolition area will be killed due to suffocation and/or crushing under the weight of the demolished bridge or the rock fill material comprising the causeway. Due to the small size of the endangered mussels (especially juveniles), and the tendency of the clubshell to be found up to four inches below the water/substrate interface, the Service anticipates that a significant percentage of the clubshell and northern riffleshell within the direct impact area will not be found during the translocation, and will therefore perish.

Juvenile and adult clubshell and northern riffleshell, and fishes which serve as hosts for their glochidia, could also be affected (i.e., killed, injured, or stressed) by substrate disturbance (e.g., scouring), increased turbidity, sediment deposition, and introduction of petroleum products into the river. These impacts would occur during bridge demolition and removal; causeway construction, use, and removal; on-bank construction activities associated with upland abutment and pier removal and replacement; construction and use of staging areas and access roads near the river; construction activities on the bridge deck; and crane and heavy equipment operation on the causeway.

The extent of these impacts will depend on construction practices, river flows during construction, silt load in disturbed substrates, and the effectiveness of erosion and sedimentation control measures. The greatest potential for substrate scouring and deposition would occur in association with construction and removal of the causeway, as well as the presence of the causeway during construction, especially during high flows.

PennDOT prepared a *Preliminary Hydrologic and Hydraulic Analysis Report* (April 10, 1997; BA, Appendix D) to assess causeway-related impacts to river flows and substrates. In this report, they modeled various flow conditions, based upon the proposed causeway design (i.e., three rock work platforms and three temporary bridges), and the inclusion of a total of nine culverts (six 96-inch, and three 72-inch) within the causeway rock platforms.

Within the project area, the Allegheny River's median mean daily flow is 11,814 cubic feet per second (cfs), as estimated from the Parker gage (RM 83.4). Under existing conditions, the flow velocity is less than four feet per second in the vicinity of the bridge crossing. Flow velocity in the shallow areas along the northeast bank (i.e., the area considered to be prime habitat for the endangered mussels), is generally less than two feet per second. At a flow of 11,814 cfs, it is predicted that the discharge velocities at the openings of the causeway would increase sharply over existing conditions, resulting in scour in the causeway openings due to transport of silt, clay, sand, and fine gravel. The largest flow increase would occur in the deep channel near the southwest bank. There would be a slight reduction in flow velocity upstream of the causeway, but no apparent areas of flow stagnation. The flow velocities will be significantly reduced approximately 100 feet downstream of the causeway, with resulting sediment deposition expected. These areas of flow reduction should dissipate within 300 to 400 feet downstream of the causeway.

A 921-foot amsl stage, which corresponds to a discharge of 25,109 cfs, has an 18 percent chance of

occurring sometime within a year period, and would result in near overtopping of the causeway. With this discharge, peak velocity at the center of the channel would increase from 6 cfs to 12 cfs with construction of the causeway, resulting in scour at the causeway openings. Upstream of the causeway, there would be decreased flow caused by pooling, primarily near the center of the channel. This could result in sediment deposition upstream of the causeway. Little change in flow velocity is predicted in the area along the northeast bank, where the prime mussel habitat occurs. Flow reductions downstream of the causeway are predicted to occur within 300 to 400 feet of the causeway. Although the culverts will only convey a small portion of the river's volume (11 to 17 percent), they will serve to reduce pooling upstream of the causeway, and redistribute the flow across the channel downstream of the causeway.

During the construction period, the causeway will also increase river stage in the vicinity of the bridge, especially during higher flows. Backwater effects are expected to occur as far as 2,600 feet upstream of the causeway.

Note that a discharge exceeding 61,200 cfs has occurred nearly every year for the past 23 years, and there is a 75 percent chance that 61,200 cfs will be exceeded in a given year. This gives some indication that the mussel community is adapted to withstand the effects of high flows. Even a discharge of 61,200 cfs, however, would not result in the transport of fine gravel in the area of prime mussel habitat, as would occur in the causeway openings under flows of 11,814 cfs and 25,109 cfs.

The modeling indicates that there will be scouring of the substrate due to increased water velocities through the culverts in the causeway and under the temporary bridges placed between the causeway sections and the shoreline. The material will be redeposited downstream when water velocity decreases. Scouring will cause mussels to become dislodged from the substrate, and either carried downstream by the current, or smothered when sediments redeposit. Those mussels not killed or injured during this process may still suffer death, injury, or increased predation risk if they are unable to right themselves and reburrow into suitable habitat downstream. Mussels, especially those within 100 feet downstream of the causeway, will be subject to the impacts (e.g., gill clogging, suffocation) of sediment redeposition.

A long-term reduction in habitat quality may occur in the vicinity of the causeway. The scouring of sand and fine gravel from the high quality mussel habitat located in the shallow waters of the northeast shoreline is of concern, as the substrate composition post-project may be different from (coarser), and of a lower quality than that which occurred pre-project. In addition, removal of the causeway material is not likely to be complete. The presence of large rock material within the endangered mussels' habitat may reduce the quality and availability of habitat post-project. Scouring may also result in subtle changes in area hydrology, as channels are formed in the river bottom, and substrate composition is altered.

As filter feeders on microscopic food items, the northern riffleshell and clubshell are very susceptible to smothering by silt and other sediments in the water (Ellis 1936, *in* U.S. Fish and Wildlife Service

1994). Siltation also may result in reduced dissolved oxygen and increased organic material at the substrate level (Ellis 1936, Harman 1974, both *in* U.S. Fish and Wildlife Service 1994). At sublethal levels, silt interferes with feeding and metabolism in general (Aldrige *et al*. 1987, *in* U.S. Fish and Wildlife Service 1994). Because the clubshell typically burrows completely beneath the substrate, it is particularly susceptible to siltation, which clogs the substrate interstices and suffocates the animal.

Mussels will be smothered, buried and/or have their gills clogged from project-related silt and other sediments. Mortality, injury and stress to mussels is expected from siltation and other types of sedimentation caused by both in-water construction (i.e., causeway construction and bridge demolition) and onshore construction (i.e., realignment of the bridge approaches, abutment construction, staging areas, and access road construction). Access to the causeway will require construction of a road on the northeast side of the river, within 25 feet of the river bank. The proximity of the access road to the river increases the likelihood of sediment and other pollutants reaching the river. Implementation of erosion and sedimentation control practices should help to minimize these sources of sediment.

Sediment and silt will also be resuspended due to project-related scouring. Deposition of silt/sediment from the project, and that already in the water column is most likely in those areas where project-related hydrological modifications reduce the water's capability to carry sediments (i.e., decreased water velocity). This is particularly likely to occur 1) upstream of the causeway as flow is restricted, causing water to pool behind the causeway, and 2) immediately downstream of the causeway, where flow has not yet redistributed across the river channel and sediments scoured from the causeway openings are likely to redeposit.

The causeway is designed such that high water events will overwash it. Because material will be staged on the causeway and there will be two sedimentation basins constructed in the causeway, overwash will result in deposition of material into the river, possibly impacting mussels downstream.

Project-related changes in hydrology that would result in pooling upstream of the causeway may result in decreased oxygen levels and decreased food and sperm availability. The clubshell generally is found in clean, coarse sand and gravel in runs; it cannot tolerate mud or slackwater conditions. The northern riffleshell also occurs in riffles and runs. It, too, may be intolerant of slackwater conditions.

The physical presence of the causeway and the altered flow conditions associated with it may also affect clubshell and northern riffleshell reproduction upstream and downstream of the causeway by affecting transport of sperm and glochidia, or by modifying host fish behavior, travel patterns, or habitat use.

Some mortality of individuals translocated out of the direct impact area is also expected due to translocation-induced stress, and/or placement in habitat potentially less suitable than that previously occupied.

After fully considering the direct and indirect effects of the proposed action, the Service believes that the clubshell and northern riffleshell will recover to levels slightly below their present levels within the action area. This conclusion is based upon the following factors: 1) the Allegheny River populations of the clubshell and northern riffleshell are intermittently distributed within more than 60 miles of the Allegheny River; 2) recruitment has been documented for both species within the action area; 3) the most significant project-related river modifications are, for the most part, temporary; 4) PennDOT will implement conservation measures to minimize impacts, including the translocation of endangered mussels outside of the construction area; 5) there will be some mortality and stress of individuals within the action area, and 6) there will probably be some long-term reductions in mussel habitat quality due to the causeway.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The biological assessment stated that the U.S. Forest Service may fund the construction of boat ramps within the project area. Because this action would be a federal activity subject to consultation pursuant to section 7 of the Act, it is not considered herein as a cumulative effect.

There are no future activities identified for the action area that may result in impacts to the clubshell and northern riffleshell.

CONCLUSION

After reviewing the current status of the clubshell and northern riffleshell, the environmental baseline for the action area, and the effects of the proposed Kennerdell bridge replacement project, it is the Service's biological opinion that the replacement of the Kennerdell bridge, with implementation of the conservation measures (i.e., commitments) proposed by PennDOT, is not likely to jeopardize the continued existence of the clubshell or the northern riffleshell. No critical habitat has been designated for these species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury

to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Federal Highway Administration so that they become binding conditions of any funding, permits, and/or approvals, as appropriate, issued to PennDOT for the exemption in section 7(o)(2) to apply. The Federal Highway Administration has a continuing duty to regulate the activity covered by this incidental take statement. If the Federal Highway Administration (1) fails to require PennDOT to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, authorization, or funding document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Federal Highway Administration or PennDOT must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(I)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates that clubshell and northern riffleshell will be taken during replacement of the Kennerdell bridge through direct mortality, injury and stress. Take is predicted to occur within the area extending from approximately 1,000 feet upstream to 400 feet downstream of the existing Kennerdell bridge.

Even assuming that a thorough search is implemented to remove and relocate clubshell and northern riffleshell from the direct impact area (i.e., the footprint of the demolition and causeway areas), not all individuals will be located. It is expected that all clubshell and northern riffleshell that are not translocated outside of the direct impact area will be killed.

Direct mortality and injury will also occur outside the direct impact area due to sedimentation resulting from construction activities, scouring, and changes in hydrology due to the causeway. Some mortality of mussels dislocated during scouring is expected due to predation and injury.

Stress, short-term reproductive impairment, and limited mortality due to changes in hydrology, including ponding and scouring, are predicted to occur as far as 1000 feet upstream and 400 feet downstream of the bridge. Stressors include low oxygen, decreased food and sperm availability in the water column, and increased silt and other sediment loading. The project will also result in loss or decreased suitability of mussel habitat due to ponding, sedimentation and scouring. These events could result in harm to

adult clubshell and northern riffleshell, the glochidia life stage, and populations of host fishes. Of particular concern would be project-related changes in habitat on the northeastern shallow side of the river.

Mortality, injury and stress are also expected to occur from translocation activities. In addition, when handling northern riffleshell during translocation activities during the late summer, spontaneous abortion of glochidia may occur.

The Service anticipates that clubshell and northern riffleshell within the action area will recover to levels slightly below their present levels. It is anticipated that post-project, much of the mussel habitat will be restored following removal of the causeway, and that mussels will eventually recolonize the area.

The actual level of incidental take will be difficult to detect or quantify for the following reasons: 1) as indicated by the results of mussel surveys within the project action area, clubshell and northern riffleshell represent a very small component of the mussel community; 2) individuals (juveniles and adults) of both species are small, and often buried in the substrate, making them difficult to locate; and 3) finding dead or injured specimens is unlikely.

Based on available information regarding project impacts, and species abundance and spatial distribution, however, the Service has estimated the minimum level of expected take (Table 1). Implementation of the proposed project would be expected to result in the take of 208 clubshell and 875 northern riffleshell within the "primary impact area" (defined under Terms and Conditions, No. 1). Take within this area is expected to be in the form of mortality and harm. If a thorough survey and effective translocation are conducted, this level of take should be reduced to 170 clubshell and 444 northern riffleshell, assuming 1) only those mussels visible at the substrate/water interface will be located and retrieved during the translocation due to the compacted nature of the substrate; 2) translocation retrieval for the clubshell and northern riffleshell will be approximately 20 percent and 55 percent, respectively (i.e., the percent of mussels exposed at the substrate/water interface); and 3) translocation-associated mortality will not exceed 10 percent.

The numerical take levels in Table 1 are intended to provide estimates of the minimum level of take due to direct effects, since the Service is unable to quantify the expected levels of take outside the primary impact area due to uncertainties regarding the extent of adverse effects expected (e.g., scouring, sedimentation, and pooling upstream and downstream of the causeway). Take within the secondary impact area is expected to be primarily in the form of harm. This area will be monitored to attempt to determine and monitor levels of take (see Terms and Conditions, No. 6b).

To further clarify and encompass all levels of take (direct and indirect), the Service is providing the following narrative statements:

1. Loss (due to death and injury) of all mussels not found and removed from the "primary impact

area" (see Terms and Conditions, No. 1) during the translocation. However, it is anticipated that recolonization by mussels will gradually occur in this area post-construction;

Table 1. Kennerdell Bridge Replacement
Estimated Extent of Take Within Primary Impact Area[1]

ESTIMATES	SECTION 1[2]		SECTION 2[3]	
	CLUBSHELL	NORTHERN RIFFLESHELL	CLUBSHELL	NORTHERN RIFFLESHELL
Surface density of mussels[4]	0.02/m^2	0.23/m^2	0	unknown[5]
Proportion of mussels at substrate surface	0.20[6]	0.55[4]	0	0.35[4]
Actual mussel density	0.10/m^2	0.42/m^2	0	unknown[5]
Number of mussels within primary impact area (= take expected *without* translocation)	208	875	0	unknown[5]
Translocation retrieval[7]	42	479	0	unknown[5]
Mussels not found during translocation (= TAKE)	166	396	0	unknown[5]
Mortality associated w/translocation[8] (= TAKE)	4	48	0	unknown[5]
TOTAL TAKE	170	444	0	unknown[5]

[1] Approximately 150 x 300 feet in size = 4167 m^2; see also Term and Condition 1a.
[2] Northeast bank to Pier 2; approximately 50 percent of the primary impact area = 2084 m^2.
[3] Pier 2 to 300 feet riverward of northeast bank; approximately 50 percent of the primary impact area = 2084 m^2.
[4] Preliminary study results, based on combined data for all species; D.R. Smith, USGS BRD, Leetown Science Center, personal communication.
[5] Due to the small number of northern riffleshell (i.e., three) found in this section, density and project-associated take levels could not be estimated, but are anticipated to be much lower than in Section 1.
[6] Assumption based on the tendency of the clubshell to burrow completely beneath the substrate.
[7] Number of mussels expected to be retrieved during the translocation, assuming only the substrate surface is inspected.
[8] Assuming up to 10 percent mortality of retrieved mussels.

2. Loss of a small percentage (#10 percent) of the translocated mussels, due to factors such as translocation-induced death, migration out of monitoring plots, and/or predation;

3. A maximum decline of 25% in mussel density, with no decline in mussel diversity, post-construction vs. pre-construction within the secondary impact area (see Terms and Conditions, No. 6) as determined from monitoring data. It is anticipated that the mussel population will have recovered sufficiently within the five-year period following construction that the overall population decline from the pre-project baseline will not exceed 10 percent;

4. A maximum loss of 5 percent of mussel habitat within the primary impact area due to incomplete removal of project-related materials (e.g., causeway rocks, demolition debris) from the river following construction;

5. The spill or release of petroleum products or other hazardous substances into the Allegheny River during construction; and

6. The discharge of large amounts of sediment during construction, as defined by a noticeable sediment plume extending more than 200 feet downstream of the causeway in the northeastern half of the river.

If criteria 5 or 6 (above) occur, the Federal Highway Administration shall immediately take remedial action(s), and contact the Service for recommendations and to determine if reinitiation of consultation will be required. If criteria 2, 3 or 4 are exceeded, the Federal Highway Administration should initiate with the Service an evaluation to determine the cause. If evidence suggests that the cause was related to the construction activities, reinitiation of consultation may be required.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the clubshell or northern riffleshell.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of *Pleurobema clava* and *Epioblasma torulosa rangiana*:

1. Prior to bridge demolition, conduct an intensive survey of the "primary impact area" (defined under Terms and Conditions, No. 1) and translocate all native mussels encountered to suitable habitat upstream of the project area.

2. Any barge, other floating craft, anchors, anchor chains, propellers, outboard motors, cranes,

bulldozers, or other equipment that originates from, or has come in contact with waters known or suspected to contain zebra mussels (such as the Mississippi or Ohio Rivers), shall be free of zebra mussel adults and veligers. This shall include equipment deployed during the translocation of *P. clava* and *E. t. rangiana*.

3. Measures shall be implemented to minimize adverse effects to *P. clava* and *E. t. rangiana* and their habitat due to project-related hydrological impacts.

4. Control measures shall be implemented to minimize project-related erosion and sedimentation, including the commitments (numbers 8 and 9) detailed in the August 7, 1997, Biological Assessment (pp. 14-17).

5. Control measures shall be implemented to ensure that hazardous substances do not enter the Allegheny River.

6. Causeway-related impacts to *P. clava* and *E. t. rangiana* shall be monitored.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Federal Highway Administration must comply with the following terms and conditions, which implement the reasonable and prudent measures described above, and outline reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Prior to bridge demolition (i.e., in July, August or September of the year prior to demolition and construction activities), translocate all live native mussels, including *P. clava* and *E. t. rangiana*, from the "primary impact area" to suitable habitat upstream of the project area (BA, commitments 10-12, pp. 15-17).

    a. The primary impact area includes the habitat most likely to be occupied by *P. clava* and *E. t. rangiana*, and most likely to be directly affected by construction and demolition activities. For the purposes of the translocation, the primary impact area is rectangular in shape, and is defined as and includes: all wetted substrate within that area of the river extending from the northeast bank to 300 feet riverward of the northeast bank (as measured from the water's edge), whose upstream and downstream boundaries are perpendicular to river flow and are defined by the outermost upstream edge and downstream edge of the causeway, plus a buffer 10 feet upstream and 30 feet downstream of the causeway edges.

    b. Develop and implement a plan for translocating mussels from the primary impact area to an appropriate relocation site(s). The plan should include: a protocol for maximizing

the probability of finding the endangered mussels; a protocol for removing mussels from the substrate; protocols for handling, holding, and marking mussels; and a delineation of the area(s) to which mussels will be relocated. All procedures and techniques will require Service approval through the Pennsylvania Ecological Services Field Office. The mussel translocation plan shall be submitted to the Service for approval at least three months prior to initiating any in-stream translocation activities.

c. Prior to the translocation effort, the primary impact area shall be clearly marked. Temporary and/or permanent marking shall be done in such a manner as to assist the translocation team. Permanent reference marking shall be done for the purposes of defining the causeway limits for the following construction season and for post-construction monitoring.

d. Collection and relocation must be done only when the water temperature is above 55 degrees Fahrenheit and water clarity is good.

e. Surveys and translocation of mussels will be performed by approved, qualified personnel who are thoroughly briefed on the techniques to be used. These personnel shall survey the primary impact area via diving, wading, and/or snorkeling, as appropriate. All mussels located shall be collected by hand and removed.

f. All mussels shall be identified to species, counted, measured and, if possible, sexed, processing all *P. clava* and *E. t. rangiana* immediately upon finding. Live specimens of *P. clava* and *E. t. rangiana* that are of sufficient size shall be marked. Live non-endangered mussels should also be marked if this will assist in post-construction monitoring.

g. While awaiting identification, marking, and relocation, *P. clava* and *E. t. rangiana* shall be held temporarily using a Service-approved protocol that will maximize survival and minimize stress (e.g., held in containers circulating river water to ensure appropriate and consistent water temperature and oxygen levels). Relocation of individual *P. clava* and *E. t. rangiana* shall take place within three hours of collection.

h. *P. clava* and *E. t. rangiana* removed during the pre-construction survey shall be relocated to suitable habitat upstream of the bridge. The relocation site shall be no closer than 1500 feet, and no farther than two miles, from the upstream limits of the causeway. Suitable habitat includes an area: 1) with stable sand/gravel or sand/gravel/cobble substrate below the ordinary low water elevation, 2) with similar mussel species diversity, including the presence of the endangered species, and 3) not currently subject to mixing zones associated with point-source discharges, or subject to evident sources of non-point source pollution.

Non-endangered mussels should be translocated in such a manner as to 1) increase their chances for survival, 2) facilitate monitoring of endangered mussels (i.e., the non-endangered species may serve as surrogates for monitoring purposes), and 3) answer research questions regarding translocation methods and/or project impacts.

i. Individual *P. clava* and *E. t. rangiana* shall be hand-placed securely in the substrate by a professional malacologist or other qualified individual. The siphons of *P. clava* and *E. t. rangiana* shall be exposed at the substrate/water interface. This will avoid dislodging of the mussels during high flow events. Due to the compacted nature of the substrate it may be necessary to excavate a place in the substrate with a tool or by hand for the endangered mussels.

j. Any *P. clava* and *E. t. rangiana* accidentally killed, or that are moribund or freshly-dead and contain soft tissues, are to be preserved according to standard museum practices, properly identified or indexed (date of collection, complete scientific and common name, latitude and longitude of collection site, description of collection site), and submitted to the Biological Resource Division, Leetown Science Center, 1700 Leetown Road, Kearneyville, WV 25430. The appropriate person at BRD should be contacted regarding proper specimen preservation and shipping procedures.

In addition, the Service's Region 5 Division of Law Enforcement must be notified within 24 hours of this take.

k. Notification must be made to the following Service offices at least two weeks prior to beginning in-stream translocation activities:

- Service's Region 5 Division of Law Enforcement, 300 Westgate Center Drive, Hadley, MA 01035-9589 (telephone: 413-253-8343)

- Service's State College, Pennsylvania Field Office, (Attn: Endangered Species Specialist), 315 South Allen Street, Suite 322, State College, PA 16801 (telephone: 814-234-4090).

l. A report documenting the translocation effort shall be prepared and submitted to the Service's Pennsylvania Field Office and the Pennsylvania Fish and Boat Commission within three months of completion of the translocation. The report shall include an introduction, methods section, results section, conclusion and/or summary, and any relevant supplementary information (e.g., names and qualifications of surveyors). The methods section should detail protocols used for surveying, holding, handling, marking, and translocating mussels; and establishment and location of the relocation site and of monitoring plot(s) within the site. The results section should include: the total number

of individuals of each mussel species collected and relocated; date collected; water and air temperatures; river stage; total number of live and dead *P. clava* and *E. t. rangiana* collected; condition, size and approximate age of live *P. clava* and *E. t. rangiana*; data regarding non-endangered mussels; and maps or figures showing 1) project features (causeway, old bridge, new bridge), and primary and secondary impact areas, 2) the relocation site and its monitoring areas/grids, and 3) number and kind of mussels within monitoring grids/areas.

m. A follow-up inspection of the relocation site will be conducted one to two months after the translocation to ensure that transplanted individuals have established themselves in the substrate and are siphoning properly. A brief report summarizing the findings of this inspection shall be prepared and submitted to the Service and the Pennsylvania Fish and Boat Commission within one month after the inspection.

n. Develop and implement a plan for monitoring translocation success for at least three years following translocation to assess the health and survivability of the translocated mussels, particularly *P. clava* and *E. t. rangiana*. Reports detailing monitoring methods and results shall be provided to the Service within three months after field work is completed. Monitoring shall occur when water temperatures are above 55 degrees Fahrenheit, and shall attempt to occur outside of the spawning periods for *P. clava* and *E. t. rangiana*. A preliminary monitoring plan, which details mussel marking methods, monitoring grid/area establishment, sampling protocols, and expected products shall be submitted to the Service for comment at least two months prior to the scheduled translocation. The final monitoring plan shall be submitted for Service approval within two months following the translocation.

2. Evidence shall be provided to the Service that all equipment to be used in the Allegheny River (during construction or mussel relocation) has never been in zebra mussel infested waters, or that equipment has been appropriately cleaned, disinfected, and inspected for zebra mussel adults and veligers, using accepted protocols.

3. Implement the project modifications and commitments (numbers 2, 4, 5, 6 and 7 as described in the August 7, 1997 Biological Assessment, pp. 14-17) designed to minimize project-related hydrological impacts (e.g., ponding and scouring) and other impacts (e.g., presence of causeway rock material following construction) to *P. clava* and *E. t. rangiana* and their habitat.

a. The causeway shall be constructed of clean rock material, shall contain flow-through culverts, and shall be completely removed following construction.

b. The spans of the causeway's temporary bridges shall be maximized to reduce the

amount of rock fill required.

c. Construction shall be completed in one construction season (approximately April to November of one year).

4. Develop and implement a project erosion and sedimentation (E&S) control plan. This plan will address all sources of project-related erosion and sedimentation, including the causeway, sedimentation basins on the causeway (how will material be contained if/when the causeway is submerged?), construction access road, changes in roadway approaches, staging areas, pier and abutment removal and replacement, etc. This plan shall be submitted to the Service for review and approval at least three months prior to beginning construction activities.

   a. Best Management Practices for erosion and sedimentation control shall be in place before, during, and, as appropriate, after any work is conducted.

   b. PennDOT or FHwA will monitor the project site daily to ensure the E&S control practices are implemented, and to identify any project-related impacts from scouring or sedimentation.

   c. Contractors should be instructed on the importance of the natural resources in the project area and the need to ensure proper implementation of the required E&S control practices.

   d. Implement a penalty system for contractors that do not fully implement the E&S control plan.

   e. Reports on implementation of these measures, and on evidence of scouring and sediment deposition, should be provided monthly to the Service. If it appears that scouring or sediment deposition are beyond that considered normal, the Service should be promptly contacted.

5. Prevent hazardous materials (e.g., petroleum products, solvents, paints, etc.) from entering the Allegheny River or contaminating soils or waters within the watershed. If a spill does occur, implement emergency remediation procedures to contain the spill and/or prevent the spill from entering the Allegheny River.

   a. Develop and implement a spill avoidance/remediation plan based on the most effective prevention and remediation practices. Such measures may include stationing of emergency response equipment at the project site, and designation of contained fueling and fuel storage areas away from the river. This plan should be submitted to the Service for review and approval at least three months prior to construction.

b. PennDOT or FHwA will monitor the project site daily to ensure that spill avoidance practices are implemented.

c. Contractors should be instructed on the importance of the natural resources in the project area and the need to ensure proper implementation of the required spill avoidance/remediation practices.

d. Implement a penalty system for contractors that do not fully implement the spill avoidance/remediation plan.

e. Monitor weather and river stages to allow removal of any hazardous materials from the causeway and the floodplain in the event that flooding is expected.

f. The Service shall be notified immediately of any spills of hazardous materials.

6. Monitor causeway-related impacts to mussels and their habitat, focusing on *P. clava* and *E. t. rangiana* (or surrogate species as appropriate). The Federal Highway Administration is responsible for monitoring the take of *P. clava* and *E. t. rangiana* that results from project-related activities; to do so, the following monitoring studies should be conducted within the impact areas:

a. Document impacts to mussel habitat within the primary impact area. Within one year following construction, the primary impact area shall be surveyed/sampled to 1) determine the percent cover of project-related material (e.g., rock from causeway, and demolition and construction debris) remaining in the river, and 2) identify any areas of noticeable scouring or sediment deposition. A sampling plan shall be submitted to the Service for review and approval at least two months prior to conducting this sampling.

b. Document scour, sedimentation, and pooling impacts to mussel diversity, density, and habitat in the secondary impact area upstream and downstream of the causeway (Biological Assessment, commitment 12, pp. 15-17).

1) The "secondary impact area" is defined as that area of the river extending from the northeast bank to 325 feet riverward of the northeast bank (as measured from the water's edge), and 400 feet upstream to 600 feet downstream of the existing bridge, but not including the primary impact area.

2) Develop and implement a monitoring plan capable of detecting project-related changes in mussel diversity, density, and habitat, as defined in the incidental take statement. The monitoring plan should be developed by a reputable biologist in coordination with the Service, and is subject to review and approval